
धान क्लीनर — परीक्षण संहिता
(पहला पुनरीक्षण)

Paddy Cleaners — Test Code
(First Revision)

ICS 65.060

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June 2023

Price Group 8

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Agriculture and Food Processing Equipment Sectional Committee had been approved by the Food and Agriculture Division Council.

The freshly harvested paddy often contains chaff, stems, stones, weed seeds, etc. This causes inconvenience in milling and results in poor output. With the modernization of rice milling industry in the country, paddy cleaners are being increasingly manufactured and used. This code is being issued in order to help in objective evaluation of the performance of the paddy cleaners.

This standard was originally published in 1977. In this revision, the standard has been brought out in the latest style and format of the Indian Standards. Further Amendment No. 1, 2 and 3 have also been incorporated.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

*Indian Standard***PADDY CLEANERS — TEST CODE***(First Revision)***1 SCOPE**

This standard prescribes the method for testing of paddy cleaners to evaluate their performance.

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

<i>IS No.</i>	<i>Title</i>
IS 4333	Methods of analysis for food grains:
(Part 1) : 2018	Refractions (<i>third revision</i>)
(Part 2) : 2017/ ISO 712 : 2009	Determination of moisture content (<i>second revision</i>)

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Aspirator — A component of the paddy cleaner used for cleaning by drawing the air through the paddy mass.

3.2 Blower — A device to produce an air blast.

3.3 Clean Paddy — Paddy free from foreign matter.

3.4 Feed Mechanism — The mechanism which regulates the feed rate.

3.5 Feed Rate — The mass of uncleaned paddy fed into the inlet of the cleaner per unit time.

3.6 Foreign Matter — It includes inorganic and organic matters. The inorganic matter shall include sand, gravel, dirt, pebbles, stones, lumps of earth, mud and iron chips. The organic matter shall include chaff, straw, weed seeds, dead insects, worms, and edible and inedible grains.

3.7 Lower Screen — The screen for separating finer foreign matter from paddy. This will be the last

screen/sieve at the bottom of the arrangement of sieves.

3.8 Magnetic Separator — A device to remove the iron materials from the paddy mass using either a permanent or temporary magnet.

3.9 Maximum Input Capacity — The maximum feed rate at which no choking occurs in the cleaner and no stalling occurs in the prime mover at the speed specified by the manufacturer.

3.10 Paddy Cleaner — A machine which removes foreign matter from the paddy mass.

3.11 Rated Input Capacity — The feed rate at which the cleaning efficiency is within the specified limit.

3.12 Routine Tests — Tests carried out on each cleaner to check the requirements which are likely to vary during operation.

3.13 Scalper — An equipment or screen used for pre-cleaning of paddy mass, by removing the larger impurities.

3.14 Screen — The component in the form of a perforated or slotted sheet or wire mesh, which separates paddy mass ingredients based on size.

3.15 Screen Cleaning Mechanism — The mechanism that keeps the screen's perforations open by removing or preventing the sieve clogging.

3.16 Screen Slope — The inclination of the screen with the horizontal in degrees.

3.17 Shaking Mechanism — The mechanism which shakes or reciprocates the set of sieves or sieve box by converting rotary motion into reciprocating motion.

3.18 Shoes — A unit of the paddy cleaner into which the screens are fitted.

3.19 Type Tests — Tests carried out on cleaner to prove conformity with the requirements of the relevant standard. These are intended to prove the general qualities and design of a particular type of cleaner.

3.20 Unclean Paddy — The mixture of clean paddy and foreign matter, which requires cleaning.

3.21 Upper Screen — This is also called top screen.

Screen to eliminate foreign matter bigger than paddy in size. The paddy flows down from upper screen to lower screen (underflow).

4 SELECTION AND SPECIFICATION OF CLEANER FOR TYPE TESTS

4.1 Selection

The cleaner shall be taken from the series production by the testing authority with the agreement of the manufacturer.

4.2 Specification

The manufacturer shall supply specification sheet duly filled in as given in Annex A and any further information required to carry out the tests. The manufacturer shall also supply all literature, operational manual, and schematic diagram of grain flow in the cleaner. The manufacturer shall also indicate the maximum input capacity and rated input capacity with the foreign matter at 5 percent and 10 percent.

5 TESTS

5.0 Tests, as indicated in **5.1** and **5.2**, shall be carried out on paddy cleaner.

5.1 Type Tests

5.1.1 General

- a) Checking of specifications (*see 7.1*),
- b) Checking of material (*see 7.2*), and
- c) Visual observations and checking of provisions for adjustments (*see 7.3*).

5.1.2 Test at No-Load

- a) Power consumption (*see 8.1*), and
- b) Visual observations (*see 8.2*).

5.1.3 Test at Load

- a) Short-run tests (*see 9.1*); and
 - 1) Visual observations (*see 9.1.5.5*),
 - 2) Cleaning efficiency (*see 9.1.7*),
 - 3) Power consumption (*see 9.1.8*), and
 - 4) Rated input capacity (*see 9.1.9*).
- b) Long-run test (*see 9.2*).

5.2 Routine Tests

- a) Visual observations and checking of provision for adjustments (*see 7.3*), and
- b) Test at no-load (*see 8*).

6 PRE-TEST OBSERVATIONS

6.1 Determination of Foreign Matter

The foreign matter present in the paddy lot to be cleaned shall be determined in accordance with IS 4333 (Part 1).

6.2 Determination of Moisture

The moisture content of the paddy shall be determined in accordance with IS 4333 (Part 2).

6.3 Running-in and Preliminary Adjustment

6.3.1 The paddy cleaner shall be installed on a level and preferably on a hard surface. All the adjustments shall be made in accordance with the manufacturer's recommendations.

6.3.2 The paddy cleaner shall be run-in without load before commencing the tests. The running-in shall be carried out in accordance with the manufacturer's recommendations.

7 GENERAL TESTS

7.1 Checking of Specifications

The specifications given by the manufacturer (*see 4.2*) shall be checked and reported in the proforma as given in Annex A.

7.2 Checking of Material

The material of construction of all the components of the cleaner shall be reported in the datasheet given in Annex B.

7.3 Visual Observations and Checking of Provision for Adjustments

The observations and adjustments given in data sheet in Annex C shall be made and reported.

8 TEST AT NO-LOAD

8.1 Power Consumption

8.1.1 The paddy cleaner shall be installed on a level and preferably on a hard surface. All the adjustments shall be made in accordance with the manufacturer's recommendations. An electric motor of appropriate power, duly fitted with an energy meter, shall be used for running the cleaner.

8.1.2 The cleaner shall be run at no-load for 10 minutes at the specified speed, and the readings

of the energy meter shall be recorded. The power consumption at no-load shall be calculated.

8.1.3 The data shall be recorded in accordance with Item (1) of datasheet given in Annex D.

8.2 Visual Observations

During and after completion of the power consumption test (*see 8.1*), the observations given in Item (2) of the datasheet in Annex D shall be made visually and recorded.

9 TEST AT LOAD

9.1 Short-Run Tests

9.1.1 The cleaner shall be installed on a level and preferably on a hard surface, and the clearances and other adjustments shall be made in accordance with the manufacturer's recommendations.

9.1.2 Sufficient quantity of paddy of the same variety having foreign matter (*see 6.1*) not exceeding 10 percent and moisture contents (*see 6.2*) not exceeding 20 percent shall be taken.

9.1.3 The paddy cleaner shall be attached with a suitable prime mover preferably with an electric motor and a suitable provision for a cut-off device for under voltage. An energy meter or some form of transmission dynamometer shall be fitted. The power delivered to the cleaner may be supplied in the following ways:

- a) Direct coupling the prime mover with the main axle of the cleaner, and
- b) Connecting the prime mover with the help of flat or V-belt and pulleys with the main axle of the cleaner and a suitable provision for a cut of device for under-voltage.

9.1.3.1 In case of (a), the power delivered to the cleaner would be the power output of the prime mover; whereas in case of (b), the allowances for flat and V-belt drive losses may be taken as 6 percent and 3 percent, respectively.

9.1.4 Determination of Maximum Input Capacity

The paddy cleaner shall be initially run for 15 minutes at 90 percent of the maximum input capacity specified by the manufacturer. If no choking occurs, the feed rate should be increased to 100 percent of the maximum input capacity specified by the manufacturer. The feed rate should be gradually increased till the stalling of the prime movers and/or choking of the paddy cleaner occurs. The feed rate thus obtained shall be the maximum

input capacity for the cleaner. Record the data in the proforma given in Annex E.

9.1.5 Operation and Collection of Data

The cleaner shall be operated at its specified speed for one hour at a feed rate slightly below the maximum input capacity.

9.1.5.1 During the one hour run, collect the following samples and data:

- a) Three sets of samples at an interval of about 20 minutes at following outlets for quantities indicated against each:
 - 1) Clean paddy outlet — 2 kg
 - 2) Foreign matter outlet — 0.5 kg
- b) The speed of the main shaft and the readings of the energy meter shall be recorded.

9.1.5.2 At the end of 1 hour feeding, the cleaner shall be run idle for some time so that practically no more material already fed comes out. At the end of the test, the material dropped through the sieve and the grain received at clean grain outlet shall be collected and weighed. The mass of the sample collected at clean grain outlet [*see 9.1.5.1 (a) 1*] shall be added to the mass of grain collected after one hour run. If tractor or engine is used as a prime mover, the fuel consumed during the run period shall also be recorded.

9.1.5.3 The test given at **9.1.5**, **9.1.5.1** and **9.1.5.2** shall be repeated for a minimum of three times at various feed rates covering approximately 50 percent, 70 percent and 90 percent of maximum input capacity.

9.1.5.4 The data shall be recorded in the data sheet as given in Annex E.

9.1.5.5 Visual observations

During and after the run, the cleaner shall be inspected visually and the observations shall be recorded in the data sheet given in Annex E.

9.1.6 Preparation and Analysis of Samples

The three sets of samples obtained at the clean grain outlet and the foreign matter outlet [*see 9.1.5.1 (a) 1*] for various feed rates shall be thoroughly mixed separately to form a composite sample. Out of these composite samples, 100 g of sample shall be taken and analyzed for the following:

- a) Main paddy outlet — To be analyzed for foreign matter.

b) Foreign matter outlet — To be analyzed for clean paddy.

9.1.6.1 Record the data in the data sheet given in Annex F.

9.1.7 Determination of Cleaning Efficiency

The cleaning efficiency shall be calculated by the following formula:

$$D = 100 \times \frac{E \times (F - G) \times (E - F) \times (I - G)}{F \times (E - G) \times (E - G) \times (I - F)}$$

where

- D = cleaning efficiency in percent;
- E = fraction of clean grain at clean grain outlet;
- F = fraction of clean grain in feed; and
- G = fraction of clean grain at foreign matter outlet.

9.1.7.1 The data shall be recorded in the datasheet as given in Annex G.

9.1.8 Determination of Power Consumption

9.1.8.1 In case of the prime mover fitted with an energy meter, the difference between two consecutive readings [see **9.1.5.1** (b)] shall be taken as the power consumption for 20 minutes. The power consumption per hour shall be calculated giving due allowances to the type of drive (see **9.1.3.1**).

9.1.8.2 In case of the prime mover fitted with a dynamometer, the average of the readings shall be taken as the average torque required. The power

requirement shall be calculated by the following formula:

$$\text{Power in kW} = \frac{T \times S}{9549.297}$$

where

- T = torque in Nm; and
- S = speed in rev/min.

9.1.8.3 The data shall be recorded in the datasheet as given in Annex G.

9.1.9 Determination of Rated Input Capacity

The feed rate shall be selected at which the cleaning efficiency shall be not less than 85 percent. The capacity in terms of energy consumed shall be calculated by dividing the capacity by the power consumed (see **9.1.8**).

9.1.9.1 The data shall be recorded in the data sheet as given in Annex G.

9.2 Long-Run Test

The cleaner shall be operated for at least 20 hours at no load which should be covered by a continuous run of at least 5 hours. The major breakdowns, defects developed and repairs made shall be recorded in the datasheet given in Annex H.

10 SUMMARY REPORT

10.1 For the guidance of the user, a summary report shall be compiled on the proforma as given in Annex J.

ANNEX A
(Clauses 4.2 and 7.1)
SPECIFICATION SHEET

TO BE FILLED IN BY

Manufacturer Testing Station

A-1 GENERAL

- a) Make
- b) Model
- c) Type
- d) Year of manufacture

A-2 POWER UNIT

- a) Type of prime mover
- b) Recommended power, kW,
- c) Type of drive

A-3 MAIN DRIVE

- a) Type
- b) Size of belt
- c) Size of pulley
- d) Diameter of main shaft

A-4 SCREENS

- a) Type
- b) Number
- c) Total length and width, mm
- d) Effective length and width, mm
- e) Number of holes per cm²
- f) Size of hole
- g) Sieve clearance, mm
- h) Screen slope range
- j) Recommended screen slope, degrees
- k) Provision for screen cleaning

A-5 SHOES

- a) Type
- b) Number of strokes per minute
- c) Length of stroke, mm
- d) Number and type of bearing,

A-6 BLOWER ASPIRATOR

- a) Type
- b) Number of blades
- c) Diameter, mm

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- d) Recommended speed, rpm
- e) Provision for changing air displacement
- f) Drive, if separate

A-7 PADDY FEEDING:

- a) Method of feeding
- b) Size of feeding chute
- c) Discharge height and location of feeding chute
- d) Recommended maximum input capacity, kg/h
- e) Rated input capacity with 5 percent foreign matter, kg/h
- f) Rated input capacity with 10 percent foreign matter, kg/h

A-8 TRANSPORT ARRANGEMENTS:

- a) Type
- b) Number of wheels
- c) Size of wheels
- d) Wheel bearing
- e) Type of towing arrangement

A-9 OVERALL DIMENSIONS:

- a) Length, mm
- b) Width, mm
- c) Height, mm
- d) Ground clearance, mm

A-10 TOOLS, ACCESSORIES AND MANUALS PROVIDED

ANNEX B*(Clause 7.2)***DATA SHEET FOR MATERIAL OF CONSTRUCTION****B-1 DATE OF TEST****B-2 MATERIAL OF CONSTRUCTION**

<i>Sl No.</i>	<i>Components</i>	<i>Material</i>	<i>Size</i>	<i>Mass</i>
(1)	(2)	(3)	(4)	(5)
i)	Frame			
ii)	Feeding chute			
iii)	Blower / Aspirator			
iv)	Main shaft			
v)	Blower Shaft			
vi)	Screen			
vii)	Shoe			
viii)	Elevator			
ix)	Transport wheel			
x)	Pulleys			
xi)	Others			

ANNEX C

(Clause 7.3)

DATA SHEET FOR VISUAL OBSERVATION AND PROVISION FOR ADJUSTMENTS

C-1 OBSERVATIONS

- a) Adequacy of marking of inlets and outlets
- b) Adequacy of protection of bearings against the ingress of dust
- c) Adequacy of safety arrangements, specially at moving points and at inlet
- d) Provision for lubrication of moving parts
- e) Provision of belts tightening
- f) Provision of transportation
- g) Provision of easy changing of components requiring frequent replacement
- h) Provision of anti-corrosive coatings
- j) Tightness of bolts, nuts and other fasteners
- k) Welding of seams
- m) Adequacy of marking to read speed of both main and blower shafts

C-2 PROVISIONS FOR ADJUSTMENTS OF:

- a) Feed rate
- b) Shaking speed
- c) Screen slope
- d) Air displacement

C-3 SAFETY ARRANGEMENTS

- a) Provision of covers for the moving parts
- b) Provision of guard for the belts, etc.
- c) Provision of overload protection switch
- d) Provision of general safety to the operator and personnel working nearby

ANNEX D

(Clauses 8.1.3.2 and 8.2)

DATA SHEET FOR TEST AT NO-LOAD

D-1 POWER CONSUMPTION

- a) Source of power
- b) Type of drive
- c) Total time of run, hours
- d) Average power consumption for 1 hour

D-2 OBSERVATIONS

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Any marked unusual wear or slackness in any component
- f) Any marked rise in bearing temperature
- g) Other observations (if any)

ANNEX E

(Clauses 9.1.4, 9.1.5.4 and 9.1.5.5)

DATA SHEET FOR TEST AT LOAD

E-1 SOURCE OF POWER

E-2 POWER RATING

E-3 TYPE OF DRIVE

E-4 VARIETY OF PADDY

E-5 MOISTURE CONTENT

E-6 PERCENTAGE OF FOREIGN MATTER IN PADDY BEFORE FEEDING

E-7 SCREEN SLOPE

E-8 SIEVE CLEARANCE

E-9 AIR FLOW

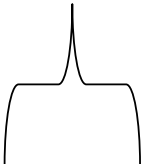
E-10 MAXIMUM INPUT CAPACITY

E-11 TEST DATA*

E-12 OBSERVATION

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Frequent clogging of screen perforations
- f) Smooth flowing of material through different components
- g) Vibration free running of fan
- h) Frequent clogging of grain in elevator unit
- j) Any marked rise in bearing temperature
- k) Any marked wear, deformation and breakdown
- m) Frequent loosening of fasteners
- n) Other observations (if any)

*The data should be collected for every test conducted on different feed rates.

<i>Sl No.</i>	<i>Date</i>	<i>Starting time</i>	<i>Stopping time</i>	<i>Duration of operation</i>	<i>Speed (rev/min)</i>	<i>Feed rate (q/h)</i>	<i>Power required (kW)</i>	<i>Fuel consumed (l/h)</i>	<i>No. of samples</i>	<i>Quantity (kg) of samples</i> 		<i>Total quantity of grain mixture at clean paddy outlet (kg)</i>	<i>Total quantity of grain mixture at sieve underflow (kg)</i>
										<i>Clean paddy outlet</i>	<i>Foreign matter outlet</i>		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
i)									i)				
ii)									ii)				
iii)									iii)				

ANNEX F

(Clause 9.1.6.1)

DATA SHEET FOR ANALYSIS OF SAMPLES

SI No.	Feed Rates	Source of Sample	Sample Mass G	Mass of		Remarks
				Clean paddy g	Foreign matter g	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		i) From clean Paddy outlet				
		ii) From foreign matter outlet				

ANNEX G*(Clauses 9.1.7.1, 9.1.8.3 and 9.1.9.1)***DATA SHEET FOR EFFICIENCY, POWER REQUIREMENT AND CAPACITIES**

Sl No.	Item	Test No's			
		1	2	3	etc.
i)	Cleaning unit speed, rev/min				
ii)	Feed rate, q/h				
iii)	Power required, kW				
iv)	Total grain received at clean grain outlet, q				
v)	Cleaning efficiency, percent				
vi)	Rated input capacity, q/h				

ANNEX H

(Clause 9.2)

DATA SHEET FOR LONG-RUN TEST

H-1 TOTAL RUNNING TIME

H-2 CONTINUOUS RUNNING TIME

H-3 BREAKDOWN IN CLEANING UNIT

H-4 BREAKDOWN IN ELEVATION UNIT

H-5 BREAKDOWN IN BODY

H-6 ANY MAJOR REPAIR CONDUCTED

H-7 ANY OTHER OBSERVATION, IF ANY

ANNEX J
(Clause 10.1)
SUMMARY REPORT

J-1 NAME OF MANUFACTURER

J-2 MODEL NUMBER

J-3 NAME OF TESTING STATION

J-4 BRIEF DESCRIPTION OF THE CLEANER

J-5 VARIETY OF PADDY USED

J-6 PERCENTAGE OF FOREIGN MATTER BEFORE FEEDING

J-7 MOISTURE CONTENT BEFORE FEEDING

J-8 PROVISIONS FOR ADJUSTMENT:

- a) Shaking speed
- b) Screen slope
- c) Air displacement
- d) Feed rate

J-9 POWER REQUIREMENT, kW:

- a) Recommended power
- b) Observed power at no-load
- c) Observed power at load at rated input capacity
- d) Observed power at maximum input capacity

J-10 CLEANING EFFICIENCY

J-11 RATED INPUT CAPACITY

J-12 ANY MARKED OBSERVATION AFFECTING PERFORMANCE

J-13 ANY MARKED BREAKDOWNS

J-14 OTHER OBSERVATIONS

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This Indian Standard has been developed from Doc No.: FAD 20 (20648).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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